enormously long birotulates of Mr. Potts's *Heteromeyenia angyrosperma* ('American Naturalist,' Dec. 1883, p. 1296, fig. 13, *e*, *f*), in which one set are very long indeed and the other comparatively short; thus the former project much beyond the latter on the statoblast, which renders its surface correspondingly irregular. Nor is the size *alone* of the cells of the parenchymatous structure of any use specifically, as I find from a variety of *Spongilla fragilis* just (12th January) received from Mr. Potts, in which there are all sizes mixed together like the bubbles in froth.

XI.—*A Reply to the Remarks of Prof. Duncan on a Paper entitled "Contributions to the Actinology of the Atlantic Ocean."* By G. Lindström.

In the 'Annals and Magazine of Natural History' for December 1883, Prof. Duncan has thought proper to criticise a paper of mine which was published in 1877. Prof. Duncan, who during the interval of seven years "felt no disposition" to "reply" to me, now finds it necessary not only to "reconsider" my paper, but to use language by no means consistent with the quiet tone that ought to prevail in scientific discussions.

Prof. Duncan seems to think* that I, convinced of my errors, especially through his writings, ought to have recanted my statements long ago, and admitted that they were erroneous. I have not done so—first, because I am not convinced that I am wrong to the extent Prof. Duncan supposes; secondly, because I could not admit facts solely upon the dictum even of Prof. Duncan himself; thirdly, because I have not had occasion to revert to this matter specially until now, when I am compelled by Prof. Duncan's uncalled-for attack, much against my will, to turn from more urgent occupations.

Premising that a great part of his criticism consists of a recapitulation of remarks already made by Pourtalès and Moseley, and with which zoophytologists have been long conversant, I shall now try to reply to the points put forward as Prof. Duncan's own animadversions.

Caryophyllia Pourtalesii, Duncan.—I was led to give this

* "I hoped that time would bring some remarks from him. . . . . These researches [of Duncan, Pourtalès, and Moseley] might have modified Prof. Lindström's views; but as they do not appear to have done so," &c. (Ann. & Mag. Nat. Hist. Dec. 1883, pp. 361, 362).

name to my specimens, which are in a fine state of preservation, on account of the description, and especially the fig. 10, pl. xlii., in Prof. Duncan's first 'Porcupine' memoir. Though not quite so clear as might be desirable, this figure is far more instructive than those given later; and I may ask any one who chooses to compare my figure in 'Actinol. Atl. Ocean,' pl. i. fig. 4, with that above mentioned, whether I was not justified in referring the North-Atlantic coral to this species. As to the pali, Prof. Duncan seems himself to admit their partial deficiency. After speaking (Ann. & Mag. Nat. Hist. Dec. 1883, p. 362) of "the irregular pali," he says, "they are especially visible when the columella is small." This seems to imply that the columella varies in size, and that when the columella is large the pali are not so visible. But I cannot make out whether this means that they are deficient or that they are hidden from view. The former is probably the case, as it is stated in Duncan's second 'Porcupine' memoir, p. 238, that "the pali . . . . are well developed when the columella has only one twist, and are less so when this structure is more complicated." The accompanying figures 4 and 7 on pl. xliii. do not show any distinct pali. Moreover it may be questioned whether what have been called pali in several of the *Caryophylliæ* and others are really structures corresponding to the first definition given by Milne-Edwards in Ann. d. Sciences Nat. 1848, vol. ix. p. 80. If we take for granted that they are to be found "*entre* les cloisons et la columelle" and independent of either, as is shown in pl. iv. fig. 1 (*Caryophyllia cyathus*) of Milne-Edwards's memoir, those occurring in *Caryophyllia Smithii* are not pali, as they are in direct continuation of the septal lamina and formed by a deep vertical incision near the interior border of the latter, being in fact nothing but the innermost part of the septa*. It may be that such false pali occur now and then in specimens of *Caryophyllia Pourtalesii*; and one of my specimens shows an irregular indentation at the interior end of only one septum. Now, if *Caryophyllia cyathus* is provided with real pali, and other species, such as *C. Smithii* and *C. Pourtalesii*, have only false pali, I think this is a sufficient reason for separating them into different genera. I have never regarded *C. Pourtalesii* as a doubtful species, but I have only questioned the pro-

* Unfortunately Milne-Edwards, in the continuation of his description, also unites with the independent structures, which alone are true pali, those lobes or "dentelures" which so often occur on the axial end of the septa and are an integral part of them. But in reality a distinction must be made between the two.

priety of placing it in the genus *Caryophyllia*; and Prof. Duncan himself seems also now to be vacillating on this point, as he (Ann. & Mag. Nat. Hist. Dec. 1883, p. 363) says that it is a member of the *Caryophyllia* "*group*" which of course is something different from the "*genus*" *Caryophyllia*.

Paracyathus thulensis I did not implicitly propose as a synonym, but with a doubt, as plainly shown by the mark of interrogation. I admit, however, that it might have been better not to have mentioned it at all.

Leptocyathus Stimpsoni, Pourtalès.—There cannot be the slightest doubt that my specimens are identical with those of Pourtalès, who kindly sent me typical specimens for comparison. I have mentioned this in my paper. Moreover, Pourtalès, in the 'Blake' Report for 1878, p. 201, confirms my determination, and says, "In the Florida Straits . . . . . quite a number were dredged of the more elongated shape, which Mr. Lindström has found to be the prevalent form in the Eastern Atlantic." I then failed, and I still fail, to detect any pali, or any thing at all deserving that name, in them; and Pourtalès also says that those of a higher order are not very distinguishable from columellar processes. He, moreover, admits that the pali may be wanting in *smaller* specimens, when he says that he found them "quite distinct in *large* specimens in front of the tertiaries." It seems, then, that if pali exist at all they are highly variable, and occur in some specimens, while they are deficient in others. Nor are the pali at all clearly indicated in the figure given by Pourtalès in 'Deep-sea Corals,' pl. iii. fig. 2.

Leptocyathus? halianthus, Lindström.—Prof. Duncan says that either the description or the figure is wrong, as they contradict each other. Both are correct, though I admit that the former might have been more complete, and that there might have been one figure more. The case stands as follows:—There are in the Swedish State Museum two specimens dredged up alive, during the expedition of H. Swed. M. ship 'Eugenie,' off Cape Frio, both broadly attached to the valves of a *Pecten*. One of them is the original of the figure 9 of pl. i. in my paper, and there only the tertiary septa coalesce with the secondary ones. But in the other specimen those of the fourth and the fifth orders are united to those of the third in one moiety of the coral, while in the opposite moiety they are straight and do not coalesce at all. This, taken together with the former specimen, shows what a highly variable character this coalescence of the septa is. There are no pali. The costæ are large and prominent where they are

not covered by a thin epitheca. It is true that the coral approaches very nearly to what I regarded as a variety of *Deltocyathus Agassizii*, pl. ii. fig. 16.

Deltocyathus Agassizii, Pourt.—Seeing the many different forms which have been lately grouped under this species, and comparing the figures of Milne-Edwards as well as original specimens from Monte Gibbio of *D. italicus*, I find that it is by no means finally settled whether *D. Agassizii* is to be merged into *D. italicus* or not.

I think Prof. Duncan makes too much of my having dared to hint at the possibility that his *Sabinotrochus apertus* might be a variety of *D. Agassizii*. "We do not want conjectures," he exclaims; and yet everybody who has consulted his writings must have noticed how freely he indulges in conjectures himself. Thus, for instance, Pourtalès remonstrates (Bull. Mus. Cambr. vol. vi. no. 4, p. 110) :—"Prof. Duncan's supposition that the office of the pali is to support an extra circle of tentacles is not borne out in this species, nor in any other paliferous coral of which I have had the opportunity of examining the polyp." Further on Professor Duncan says, "Certainly the costæ and pali of *Trochocyathus Rawsoni* remove it entirely from *Deltocyathus*. . . . After seeing Lindström's criticism Pourtalès still retained the form in the genus *Trochocyathus*;" but Prof. Duncan omits quoting the following statement of Pourtalès (Bull. vol. v. no. 9, p. 199) :—"There is no possibility of identity of this species with *D. Agassizii*, as supposed by Lindström, *though there is very little doubt that the two genera can scarcely be kept separate.*" In fact the numerous small, discoid, *Fungia*-like corals yet await a final arrangement by somebody who shall have access to all species described and to large numbers of specimens. This is evident when we see such zoophytologists as Pourtalès and Duncan give such conflicting opinions.

Flabellum laciniatum, Philippi.—Considering the many different forms of *Deltocyathus* which have been comprised under one and the same species, I find it less unreasonable to unite such forms as *Flabellum alabastrum* and *F. laciniatum*. My specimen, dredged up from 200–300 fathoms off the Azores, from its deeper coloration and the nearly straight edges of the septa, may be regarded as a variety of the North-Atlantic species. Prof. Moseley also says, "I cannot, however, tell what amount of variation a long series of specimens might show."

Schizocyathus fissilis, Pourt.—On comparing the figures given by Pourtalès and myself, there can be little doubt that we have described the same species. The presumed discre-

pancies may be reconciled in the following manner. We have given different values to the septal orders, viz. :—

The *primary* septa of Pourtalès are my				*tertiary*	septa.
The *secondary*	„	„	„	*primary*	„
The *tertiary*	„	„	„	*secondary*	„

Those large septa which are enclosed by a pair of other septa I regarded as the primaries. I was led to this by what I had learnt from *Balanophyllia Goësii* (Actin. Atl. Ocean, pl. iii. figs. 40–42), in which it is evident that the primaries are enclosed within two of the next succeeding order, that is the secondary, so that there are two secondaries for each of the primaries, or in all twelve, as seen on plate iii. fig. 41, in Actin. Atl. Ocean. On comparing smaller and larger specimens of *Schizocyathus* I cannot but think that I was right in arranging the septa as I had done. The primaries of Pourtalès are easily recognizable by their position inside the distinct line which is so clearly visible on the wall outside, and along which the coral splits. Now in the smallest specimens, scarcely 1 millimetre in length, what I have called primaries are the largest septa developed, and the primaries of Pourtalès, my tertiaries, are just beginning to appear.

Prof. Duncan further says (p. 367), "that there are no septa in Lindström's figure (pl. ii. fig. 27) in the position of the primaries of Pourtalès." It is true that they are not visible in the specimen figured, because their growth has ceased or is retarded, as is shown on the same plate (fig. 26). But I have other specimens, in which these septa, though short, are as plainly seen on a level with the others in the calicle as in the original specimen of Pourtalès.

As to my remark on the composition of the septum of three distinct strata or laminæ, one central enclosed within two lateral ones, Prof. Duncan makes a quasi-quotation from my paper, from which it might be implied that I have contradicted myself or partially admitted the truth of the old opinion. After briefly stating my views he adds that, "He [Lindström] *candidly admits* that the two laminæ are to be seen in some fossils" (Ann. & Mag. Nat. Hist. Dec. 1883, p. 367). I said, consistently with my view of there being three structural elements in the septum, that old and weathered specimens *look* just as if they had septa consisting only of two laminæ; but this is only owing to the central or original lamina having been removed by solution and its place left empty (Actin. Atl. Ocean, p. 17). It is just this structure of the septum which is one of the chief points that link the

Recent and Mesozoic corals with the Palæozoic forms, in which the same structure is often retained and easily enough distinguished.

Stenocyathus vermiformis, Pourtalès.—Prof. Duncan contends "that it is hardly conceivable that they [Pourtalès and Lindström] are treating of the same species." I have now, when I write this, and had also when I described the species, three specimens of *S. vermiformis*, sent from Pourtalès himself, named in his own handwriting *Cœnocyathus? vermiformis*, which was the first denomination given to the species. I cannot but see, even now on renewed examination, that his specimens and mine belong to the same species. Prof. Duncan, who must have seen so many specimens of living and fossil corals, ought certainly to be aware of their great variability—how some specimens take the shape of a regular cone, while others of the same species are crooked and vermiform; and consequently he ought not to be so much astonished, as he seems to have been, that I have placed turbinate and vermiform corals together. It is indeed more easy to reconcile my specimens with those of Pourtalès and with the fig. 12, pl. iii., in his 'Deep-sea Corals,' than to identify the figures 1 and 2, pl. i., in the same memoir with those given on pl. iii. figs. 11 and 12. Judging from these it really seems as if there had been two different species, one of which tallies with those described by me and with the specimens sent from Pourtalès. The latter author, in 'Deep-sea Corals,' p. 92, explanation of figures, says also that the calicle of fig. 12, pl. iii., is more common than that of pl. i. fig. 2. Moreover, I have now made a section near the wall of one of the specimens sent by Pourtalès, and it does not in any way differ from fig. 9, p. 20, in my paper. It depends, of course, much on the state of preservation of the coral whether this dissepimental trellis-work is left or not, as in the lower and older parts of the coral, where it may have disappeared through solution or other changes.

At present my time and the materials at hand do not admit of my entering further into the questions raised by Prof. Duncan's criticism, or attempting to settle finally some of the moot points, which would require more figures and more research than I can now bestow upon them. I have only defended my statements and views against him, and now leave to the unbiassed reader to decide on which side the "very hasty criticism" lies.